

REMARKS

On May 3, 2006, claims 1-18 were submitted and claims 10, 11, and 13 were amended. In a Preliminary Amendment submitted on the February 22, 2007 filing date, Applicants amended claims 6, 17, and 18, and added new claims 19-24. Currently, Applicants cancel claims 4 and 19, and amend claims 1, 3, 6-8, 10-12, 14-18, and 20-24. Claims 1-3, 5-18, and 20-24 are pending. Reconsideration of the application and allowance of all claims pending herein are respectfully requested in view of the remarks below.

Rejections under 35 U.S.C. § 112

The Office Action of June 15, 2009 rejected claims 6-24 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as the invention. The Office Action indicates that claim 6 is rejected because “selected from . . . and . . . processing” is improper Markush language which renders the claim indefinite. Applicants have amended claim 6 to include the term “consisting of,” to conform to proper Markush language requirements.

Claims 7 and 8 were rejected as indefinite because of the inclusion of slash marks. Claim 7 has been amended to clarify that the slash marks meant and/or, as indicated by the new language which refers to “ores bearing at least one of copper, iron, and sulphur.” Support for this amendment can be found on page 7, line 2 to 4 of the specification, which indicates that chalcocites are examples of the copper/iron/sulphur bearing ores. The recitation of chalcocite, copper(I) sulfide (Cu₂S), demonstrates Applicants’ intent for the slashes to mean “and/or” because chalcocite ores include copper and sulfur. Claim 8 has been amended to clarify that the slashes were intended to mean a “ferric and [[/]]acid leach”. This amendment is supported by page 8, lines 4-5 of the specification, where it is indicated that atmospheric leaching of the ores is performed using a solution that includes ferric ions and sulfuric acid.

Claim 10 was rejected on the basis that “said basic ferric sulphate leaching step” and “the slurry” lacked antecedent basis. Claim 10 depends from claim 1. Claim 10 has been amended to refer to the “reaction of basic ferric sulphate with excess sulphuric acid”, as stated in

claim 1. Claim 10 has also been amended to refer to the production of a slurry, which provides an antecedent basis for the later term “the slurry”.

The Office Action rejected claim 11 because “the basic ferric sulphate slurry” lacked proper antecedent basis. Claim 11 has been amended to refer to the “reaction of basic ferric sulphate with excess sulphuric acid” that is stated in claim 1. Also, claim 11 has been amended by replacing the term “the basic ferric sulphate slurry” with “a basic ferric sulphate slurry obtained...” Therefore, Applicants respectfully assert that the antecedent basis rejections of claim 11 are no longer applicable.

Claim 12 was rejected for the term “said basic ferric sulphate autoclave slurries” lacking proper antecedent basis. The term in original claim 12 has been replaced with the term “said basic ferric sulphate slurry”, which is consistent with amended claim 11, from which claim 12 depends. Applicants respectfully assert that the amendment to claim 11 provides a proper antecedent basis for the term “said basic ferric sulphate slurry” in claim 12.

Claim 14 was rejected for “the pyrites-containing solids” and “the pregnant leach solution” lacking antecedent basis. Claim 14 has been amended by removing the word “the” from the term “the pyrites-containing solids”. Also, 14(b) has been amended to recite the term “a pregnant leach solution obtained from...”.

Claim 16 was rejected on the basis that the term “off” is superfluous, which renders the claim indefinite. This term is deleted in amended claim 16. Claims 17, 21, and 22 were rejected based on the assertion that “sufficiently high” is indefinite as to what is considered to be sufficient. Claims 17, 21, and 22 have been amended by deleting the phrase “if the pyrite content is sufficiently high.” Because the allegedly indefinite terms are longer present in amended claims 16, 17, 21, and 22, Applicants assert that the rejections are now moot.

The Office Action rejected claims 19 and 20 because “selected from . . . and . . . processing” is improper Markush language which renders the claims indefinite. Claim 19 is cancelled. Applicants have amended claim 20 to include the term “consisting of,” to conform with proper Markush requirements.

Applicants respectfully assert that in view of the above amendments, the 35 U.S.C. § 112 rejections are no longer applicable.

Rejections under 35 U.S.C. § 103

The Office Action rejected claims 1-24 under 35 U.S.C. § 103(a) as being unpatentable over Verbaan (US 4,431,613) in view of Hourn (US 5,993,635) and Collins (5,730,776). Claims 1 and 14 are independent. The remaining claims depend from, and add limitations to either claim 1 or 14. Currently, Applicants amend claims 1 and 14 to clarify that the leach extraction of mineral bearing ores and concentrates is performed “at a temperature of 195 to 270 °C”. Support for this amendment can be found in FIG. 1, FIG. 2, and FIG. 3, all of which show that the autoclave temperature is 195 to 270 °C.

Verbaan discloses a leaching method that is performed at 70 to 120 °C (See Verbaan, col. 2, lines 42-43), preferably carried out at 90 °C (Verbaan, col. 4, lines 61-62). “The choice of the temperature of about 90 °C ensures that elemental sulphur which is freed from the material remains in the solid form and thus prevents molten sulphur from blinding the ground material.” (Verbaan, col. 4, line 66 through col. 5, line 2). Verbaan also provides that the use of such a relatively low temperature enables ordinary rubber lined reaction vessels to be utilized thereby avoiding the high capital cost of expensive alternative materials which may be required for appreciably higher temperatures. (Verbaan, col. 5, lines 2-6).

Verbaan’s use of lower temperatures to ensure that sulfur remains in a solid form is consistent with the disclosure in the instant application, which provides that higher autoclave temperatures result in “precipitation of elemental sulphur, which creates processing difficulties at elevated temperatures at which viscous allotropes of sulphur form.” Unlike Verbaan’s method, which requires lower temperatures to avoid viscous sulphur, the instantly claimed method needs high temperatures well above those that would result in viscous sulphur. Indeed, the instant invention actually requires temperatures of 195 to 270 °C to ensure oxidation to sulphate. Applicants’ method therefore results in the formation of basic ferric sulphate, while Verbaan’s method does not. For this reason, Verbaan also does not utilize a leaching process, which is a key feature of Applicants’ invention.

Hourn discloses a method of atmospheric mineral leaching that is performed “under ambient conditions in open reactors.” (See Hourn col. 3, lines 55-56). Hourn’s method is performed at temperatures below 100 °C (Col. 5, line 64), preferably at about 60 °C and 1 atm (Col. 5, line 66). In view of the amendments to the claims clarifying that the mineral leaching is

performed at temperatures of 195 to 270 °C, it is clear that similar to Verbaan, Hourn teaches away from Applicants' method. Indeed, Column 2 of Hourn distinguishes previous methods that, similar to the claimed methods, use high temperatures (150-210 °C) and pressures, and whose "high costs... detract from the wider acceptance of high pressure/high temperature oxidation." The instantly claimed method also differs from Hourn insofar as formation and leaching of basic ferric sulphate is imperative. In contrast, Hourn provides that "[f]urther oxidation of the elemental sulphur to sulphate ... requires elevated temperature and pressure and does not occur to any significant extent under the leaching conditions of the present invention." (See Hourn, col. 6 lines 43-49).

Collins' method of extracting copper involves the use of dilute sulphuric acid and a carbonaceous additive. This method is carried out preferably at temperatures above the melting point of sulphur but below about 200 °C (See Abstract). Preferably, the process is carried out in the range of 135-175 °C, which Collins indicates produces "substantially complete extraction of copper values from said concentrate as soluble copper sulphate. Concurrent conversion of the major fraction of sulphide sulphur to elemental form occurs." (Col. 4, lines 27-33). Unlike Collins' method, the presently claimed method uses higher temperatures, which result in oxidation of all sulfides to sulphate. In the specification, Collins mentions once that a major portion of the iron is precipitated as the basic ferric sulphate and as hydrated iron oxide, but rather than utilizing this precipitate, Collins focuses instead on the product leach solution, which contains the dissolved copper of interest. Indeed, Collins indicates a desire to minimize the basic ferric sulphate precipitate. He provides that temperatures above 200 °C are not recommended because "leaching of copper occurs rapidly and completely, but the sulphides are oxidized to sulphate, rather than to elemental sulphur. This reaction consumes economically prohibitive amounts of oxygen whilst generating high concentrations of sulphuric acid which are costly to neutralize." (Col. 1, lines 58-64). Applicants, on the other hand, utilize the higher temperatures to ensure complete oxidation to sulphate, because their method utilizes the basic ferric sulphate that is formed.

In summary, Applicants' method involves the leaching of mineral compositions at high temperatures. Verbaan and Hourn teach away from using high temperatures, and instead use temperatures generally below the melting point of sulfur (~118 °C) in order to avoid sulphur precipitation and processing difficulties, among other things. Since Verbaan and Hourn

explicitly indicate that they use low temperatures to avoid the complications associated with higher temperatures, one skilled in the art would not be motivated to combine the references with a reference that uses relatively higher temperatures, such as Collins. It follows that even if one skilled in the art were motivated to combine the references, the instantly claimed invention would not be obvious in view of the result. The references use temperatures lower than those used in the instant invention. Furthermore, none of the references teaches a method for leach extraction that includes an aqueous stream that is comprised of a solution formed by reaction of basic ferric sulphate with excess sulphuric acid. In view of the above, and the temperature limitation that has been added to the pending claims, Applicants respectfully assert that the instantly claimed invention is not obvious over Verbaan in view of Hourn and Collins.

No fees are believed due. However, the Commissioner is hereby authorized to charge any fees that may be required, or credit any overpayment to Deposit Account No. 08-1935, Reference No. 1510.011.

There being no other outstanding issues, it is believed that the application is in condition for allowance, and such action is respectfully requested.

Respectfully submitted,



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